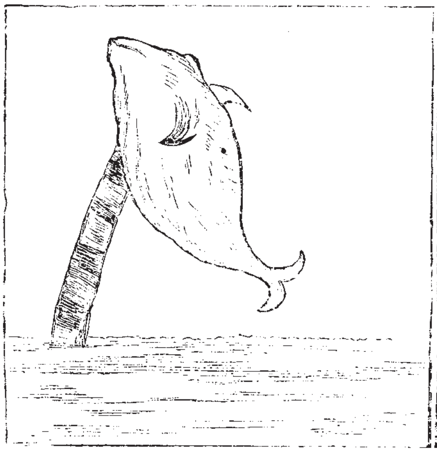
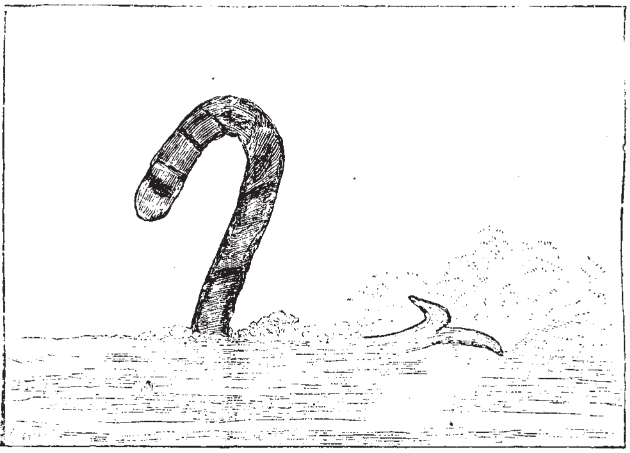
feet in length,[1] while its great double-fanged but knife-edged molars show that it was carnivorous; and as we are not so far removed from the period of the Alabama Tertiaries as to render it improbable that members of what must once have been a great order of carnivorous cetacea, totally distinct from the orders of cetacea hitherto known as living, may still survive, I have braved the ridicule attaching to this subject so far as to invite attention to it.

The second of the two figures in the *Graphic* shows the long-necked animal to possess the cetacean tail, and its head there seems to have been turned from the observer, so that the underside of it only is presented. The first figure shows that the whale had been seized on its flank by the powerful bite of its aggressor, and that to escape from this it had thrown itself out of the water. Having succeeded in this object the second figure shows the aggressor rearing its head and neck out of the water to discover the direction which its prey had taken, in order that it might follow it up; and so far from the charge of curious drawing made by the editor of the *Graphic* being justified, the representation of the whale can be at once recognised as fairly correct; while that of the tail of the unknown animal (which probably prompted this charge), so far from being curious, forms an important piece of evidence as showing the animal in question to be cetacean. SEARLES V. WOOD, Jun.

Martlesham, near Woodbridge, September 27

P.S.—Since sending to you the above I have again seen my relative, and find that the cut in the *Graphic* of July 19, 1879, is not that of the instance observed from the steamer in which she came home, which was the *City of Washington*, but of a separate instance which occurred to another ship. I have not been able yet to procure the *Graphic* containing the figure of the animal seen from the *City of Washington*, but she tells me that it was pasted up in the saloon, and represented only the head and long neck of the animal, which was raised to a great height out of the water, and near to the ship; and had been drawn for the *Graphic* by a lady passenger immediately after the occurrence. These repeated and independent notices of the same long-necked animal are, however, the more confirmatory of its existence.





I find that Prof. Owen, in his article on Palæontology in the *Encyclopædia Britannica* (vol. xvii. p. 166), in giving a description of *Zeuglodon cetoides*, says that "the skull is very long and narrow *and the nostril single*," that Dr. Harlan obtained the teeth on which, correcting Harlan's reptilian reference of them, he founded the order *Zeuglodontia*, from the Miocene of Malta; and that the teeth discovered by Grateloup in the Miocene beds of the Gironde and Herault, and ascribed by him also to a reptile under the name of *Squalodon*, are those of a smaller species of *Zeuglodon*. The remains of *Squalodon*, along with those of the shark with huge teeth, *Carcharodon megalodon*, and of numerous cetaceans assigned to orders all still living, and of which some, such as *Delphinus*, belong to living *genera*, occur in the "Sables inférieurs" of Antwerp; which, though long called Miocene, are by M. Vandenbroeck regarded as older Pliocene, and as the base of that series of deposits of which the middle and upper divisions are respectively represented by the Coralline and Red Crags of England; and with these "Sables inférieurs" the so-called Miocene of Malta, in which *Zeuglodon* is associated with *Carcharodon*, is probably coeval. Dr. Gibbes (*Jour. Acad. Nat. Sc.*, 2d. ser., vol. i. p. 143), figures and describes teeth of the Antwerp species of *Carcharodon* from both the Eocene of South Carolina and the Miocene of Alabama These various references bring the *Zeuglodonts*, with their *Carcharodon* associates, down to a late geological period, during which they co-existed with Delphinian prey; and of this prey the whale in the woodcut (which looks like a *Grampus*) seems an example.

It is most likely that Bishop Pontoppidan, a copy of the English (1755) edition of whose work I possess, concocted his two figures (one of which is that of a huge snake undulating on the waves, and the other that of a serpent-like animal with pectoral flappers or fins, resting almost on the surface of the sea, with head and tail erect out of the water like the letter U, and spouting water or steam from its mouth *in a single column*), from accounts given him by Norwegian seamen, some of whom had seen the animal in the position in which it was observed from the *Dædalus*, and others in that in which it is represented in the cut as seen from the *Kiushiu-maru*; for in the long narrative which he gives of the descriptions received from observers at numerous times, some of these agree with the one, and some with the other, though both of the Bishop's figures represent only preposterous conceptions of his own.

[The animal seen from the *Osborne*, and figured in the *Graphic* of June 30, 1877, as the "Sea-serpent," is quite a different thing from the one in question, and may have been a *manatee*.]

Temperature of the Breath

THE interesting observation made by Dr. Dudgeon (NATURE, vol. xxii. p. 241, and vol. xxiii. p. 10) to the effect that breathing on the bulb of a thermometer through several folds of flannel or silk raises the temperature of the instrument several degrees above that of the mouth and body, is easily verified. There is no doubt about the accuracy of the observation; but the explanation of it offered by Dr. Dudgeon is not satisfactory. He supposes that the heightened temperature is due to the expired air being hotter—not cooler, as is usually believed—than the mouth and body. A simple experiment sufficed to show that this view was untenable. A clinical thermometer was inserted in the cavity of the mouth, and the stem grasped by the teeth in such a way that the bulb lay free in the oral cavity. Inspiration was carried on by the nostrils, and expiration was effected by gently forcing the breath between the loosely-closed lips and the stem of the instrument. The bulb was thus placed in the centre of the stream of expired air and kept free from contact with the tongue and cheeks. Experimenting in this way, I found, at the end of five, and also of ten, minutes that the thermometer marked 97·2°—the temperature under the tongue at the time being 98·4°.

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[1] He observes in the third edition of his "Manual of Elementary Geology" (1851), p. 208, that he visited the spot where a vertebral column of this length belonging to *Zeuglodon* had been dug up.

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Had the breath been hotter than the mouth the instrument could not have failed to register a higher temperature than 98·4°, but being really cooler, the instrument, of course, recorded a lower temperature.

What is then the true explanation of the phenomenon observed by Dr. Dudgeon? I believe that it is simply an example of the conversion of latent into sensible heat by the rapid condensation of aqueous vapour. The organic fabrics which compose our clothing are all more or less hygroscopic—that is to say, they have the capacity of imbibing aqueous vapour and condensing it into the solid and liquid forms. The expired breath is heavily charged with aqueous vapour; and aqueous vapour, at the moment of condensation, liberates an enormous amount of latent heat, which thus becomes sensible to the thermometer. In this particular watery vapour exceeds far away all other gases.

The following experiments were made with a view of testing the correctness of this view. Two strips of flannel were prepared, each six inches long and an inch and a quarter wide. The first strip was rolled, without any preliminary preparation, round the bulb of a clinical thermometer. The bulb, thus enveloped, was inserted between the closed lips, and the expired air was forced through the porous material for a period of five minutes. The thermometer rose to 104°. The instrument was then allowed to cool, and, after having been re-set, was again inserted between the lips, and breathed through for a second period of five minutes. This time the temperature only rose to 101°. The experiment was repeated a third time for a similar period, but this time the thermometer did not rise above 98·6.

These results tallied exactly with the requirements of the condensation hypothesis. During the first period the fresh dry flannel absorbed and condensed the watery vapour passing through it with such rapidity that the liberated sensible heat was sufficient to raise the mercury several degrees above the temperature of the mouth. In the second period of five minutes the hygroscopic activity of the flannel had been greatly reduced by the previous absorption of aqueous vapour, and the thermometer only rose slightly. In the third period saturation had been approached, and the breath passed through the flannel almost without depositing any of its moisture, and accordingly the thermometer only indicated a temperature slightly higher than that of the mouth.

The second strip of flannel was subjected to a little preliminary preparation. In order to increase its hygroscopic activity it was thoroughly dried (superexsiccated) by holding it for a few minutes before the fire. When it had cooled down to the temperature of the room it was wrapped round the bulb of the thermometer, and the experiment was proceeded with as before. The result surprised me. *In one minute* the mercury had risen not only to the top of the scale (112° F.), but had filled the little bulb above it, that is to say, it had risen to at least 115° F. When the instrument had cooled it was reset, and inserted again between the lips and breathed through for three minutes. At the end of this time the scale marked 106° F. After the instrument had been cooled and reset the experiment was repeated a third time, and the temperature only reached 102° after breathing through the envelope for four minutes. A fourth trial of four minutes only produced a record of 98·4°. Here again the development of heat steadily declined as the flannel became less hygroscopic.

It is probable that, with the superexsiccated flannel the first portions of aqueous vapour condensed at the beginning of the experiment pass at once from the gaseous into the solid form, and constitute that portion of water which is incorporated in intimate union with all organic tissues. This accounts for the extreme rapidity of the development of heat at the commencement of the experiment. I found that even a single long expiration through the freshly-warmed flannel raised the mercury to 110° F.

Dr. Dudgeon's observation will not necessitate a revision of our conclusions respecting the temperature of the breath, but he has supplied us with an exceedingly elegant and easy way of demonstrating the liberation of sensible heat which takes place during the passage of water from the gaseous into the solid and liquid state. WM. ROBERTS

Manchester, November 10

Height of the Aurora

IN NATURE, vol. xxii. p. 291, is inserted a letter of Mr. T. Rand Capron, on the determination of the height of auroræ, wherein I read: "It is unfortunate that simultaneous observations of the auroral corona are almost entirely wanting. I . . . would be glad if any particulars could now be furnished me."

Having treated the subject of the auroræ and their properties in an ample manner in my "Théorie cosmique de l'Aurore polaire" (*Memorie della Società degli Spettroscopisti Italiani*, 1878, vol. vii.), wherein I have adduced proofs of the thesis that *The corona is an optical illusion, due to the laws of celestial perspective*, I was astonished to find the alleged words used by so great an authority. That "simultaneous observations" of the auroral corona will be ever without any result, as far as its height above the earth is concerned, follows already from the known property, that the corona always shows itself in the direction of the *local* magnetic total force (given by the inclination needle).

Regretting that such a well-established fact seems not generally known, I take the liberty to refer Mr. Rand Capron to the chapter of my treatise, "Dans quelle Région de l'Atmosphère terrestre se trouvent les Rayons de l'Aurore polaire, et est-ce que la Couronne est une Chose réelle?" and will repeat here that very beautiful determinations of the height of streamers and beams were obtained by Prof. Heis and Dr. Flögel, and by Prof. Galle in Germany, showing a height of the phenomenon from 20 to 100 miles (of 15 in 1 degree). These results are published in the *Zeitschrift der oesterr. Gesellsch. f. Meteor.* vii. p. 73.

I regret to have found no earlier opportunity of answering the request of Mr. Rand Capron, but think that this letter may still have some interest, notwithstanding the valuable article by Mr. Plummer in NATURE, vol. xxii. p. 362.

Groningen (Netherlands), H. T. H. GRONEMAN
November 10

Fascination

As a contribution to this subject, at least of new material if of no decisive evidence in support of any existing theory, I offer the conclusions which Malachi Foot, Member of the College of Physicians and Surgeons, N.Y., reached in 1807 relative to this matter. A short memoir of his which I recently met was published in the *Medical Repository* for that year, entitled "An Examination of Dr. Hugh Williamson's Memoir on Fascination, to which is subjoined a New Theory of that Phenomenon," and is striking both in matter and conception.

The author, after displaying some temper over Dr. Williamson's willingness to attribute the well-accredited effects of snake-charming to terror, producing in the victim a condition which he (Dr. Williamson) terms "dementation," and "wherein extreme fear stupefies the mind and deprives him of the understanding," produces his own explanation. Although he acknowledges the paralysing effects of fright, and instances quadrupeds falling lifeless from the effect of fear, deer stricken motionless by the light of a torch, &c., yet he inveighs against the false reasoning which discovers in these cases of arrested volition any analogy to the phenomena of so-called fascination. Our author, evidently of no superstitious habit, distinctly admits the fact that the snake repeatedly captures prey by a method seemingly so occult as to merit the characterisation of fascination, and develops his theory in the light of that very thought.

He ascribes to the primary sensations of animals, in them unmodified by reflection as to their source or character, complete efficacy to awaken emotions of pleasure of an intensity to us quite incommensurate with the apparent causes which evoked them—emotions so powerful as to absorb all other secondary feeling, enfolding the animal in a delightful but numbing trance, whose stages advance from attention through ecstasy to anæsthesia. And he finds in the eye a sensory centre which most expansively responds to all outward stimuli. This much premised, he applies it to the case in hand. The snake, fixing its glittering eyes with hungry expectancy upon its victim, at the same time throws its body into graceful curves and raises its tail, undulating with a soft and inviting motion. (Foot insists upon the almost invariable accompaniment of motion as auxiliary in attracting and pleasing the prey.) The bird's eye, once caught, becomes ensnared in the endless succession of contortions, and it draws near, dominated by simple delight.

As Foot expresses it, "the pleasurable movements of the organs of vision stimulate to approach and excite an eager desire to embrace." *Reverie oculorum* ensues, and the bird flutters helpless to the ground. Foot speaks of having seen a cat succeed in similarly charming birds by wreathing the body and waving the tail. He might have confounded this with the

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